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COMMUNICATIONS

NATURE-STUDY AND HIGH-SCHOOL SCIENCE

The most notable change in the science-teaching situation in the last decade has been the very rapid advent both in the grades and in the high school of elementary agriculture and domestic science. Thus 29.2 per cent of the enrolment in science in Ohio schools (*Ohio School Report*, 1913, p. 70) is in agriculture and domestic science, the reported increase in these subjects combined being over 9,000 per cent in the five years from 1909 to 1913. In the same period in Minnesota the increase in enrolment in these two subjects has been over 800 per cent (*Twelfth Annual Report of the Inspector of State High Schools*, 1913). During the same time the increase in the enrolment in agriculture in the first-class high schools of Missouri has been nearly 500 per cent (*Report of State Superintendent of Schools*, 1913). In 1909, 16 schools in Ontario were giving courses in agriculture; in 1914, 278 were giving such courses (*Bulletin No. 10*, Ontario Department of Education). These are but sample citations that might be multiplied greatly, but they are enough to illustrate the general thesis.

This gain in agriculture and domestic science is made in spite of the fact that the enrolment in the old-line sciences, such as physics, chemistry, physical geography, etc., is and has been for some time on the decline.¹

The foregoing facts seem to contradict the conclusions of such studies of children's interests² as have been thus far made, for these studies, incomplete though they are, indicate that children, both those of grade and (possibly) those of high-school age, are not particularly interested in nature materials from the utilitarian point of view. They are interested in the usefulness of such things, but it is in usefulness in play,

¹ Fred D. Barber, *School Science and Mathematics*, XV, No. 3 (March, 1915), 221; W. J. Bray, "A Study of the First Class High Schools of Missouri," *Normal School Index*, Kirksville, Mo., VI, No. 49 (February 5, 1915).

² Laura E. Mau, "Interests of Children in Nature Material," *Nature Study Review*, VIII, No. 8 (November, 1912), 285-90; Elliot R. Downing, "Children's Interests in Nature Material, *Nature Study Review*, VIII, No. 9 (December, 1912); Gilbert H. Trafton, "Children's Interests in Nature Materials," *Nature Study Review*, IX, No. 6 (September, 1913).

usefulness from the child's point of view, and not in utility from the "practical" point of the adult.

It would seem, then, that the avidity with which children take to agriculture and domestic science must be due rather to the new method of presentation of science material than to the new content of subject-matter. An analysis of the available school texts in agriculture shows quite conclusively that a large portion of the subject-matter is the same as was previously presented in botany and zoölogy texts, but this subject-matter is now presented in concrete form. A definite situation, a project or problem well within the experience of the average child, is the starting-point. The discussion may lead to a statement of general laws and principles similar to those stated in the more formal presentation which we get in the usual botany and zoölogy.

This in part at least is also the method of nature-study. Nature-study is an attempt to bring conscious order out of the apparently more or less chaotic environment of the child, but it starts with the environment as a whole. It proceeds from a superficial familiarity with the many phases of that environment to a more intensive study of certain typical aspects. Nature-study involves more than this, but this is one of its fundamental characteristics. Science is a cold, impartial presentation of fact. It fails to stir the emotions, to stimulate the will. But add to the scientific statement of fact the artist's joy in beauty, the glamor of poetic presentation, the raconteur's literary style, the interest of human kinship, and it makes subject-matter in which the imaginative child's soul revels. Nature-study aims at an ennobling, inspiring, healing companionship with nature rather than mere knowledge of nature. The knowledge of nature and the training involved in its acquisition are recognized however, as of prime importance.

This approach to intellectual appreciation and comprehension of natural phenomena through a study of concrete situations or projects is quite in accord with our modern knowledge regarding the method by which the child's mind works. Such studies in the thinking processes of children as have been made seem to indicate that the natural mode of attack is to grasp the situation as a whole, first; then to comprehend its parts, later their relationships to each other. Soon a second situation is similarly comprehended and analyzed. It is only after many such experiences and analyses that the individual begins to synthesize general ideas and arrive at scientific principles.¹ The scientific organization of subject-matter and the elucidation of laws and fundamental

¹ Dewey, *How We Think*; Thorndike, *The Psychology of Learning*.

principles is a late stage in the racial and should be a late stage in the individual intellectual development. Children begin to reason moderately early but reason efficiently only with concrete materials. Abstraction is a thing of late adolescence. What facts we have regarding the acquisition of scientific principles show that these are more readily acquired when the study of them is initiated by the presentation of concrete materials which embody them than when the abstract principles are first stated and their application is illustrated with the materials that elucidate them. There seems then abundant grounds for the justification of the usual methods in vogue in nature-study. This is no attempt to justify all nature-teaching in the grades, only to substantiate the best of the methods used. Nor is it desirable to close our eyes to the many atrocities that have been committed in the name of nature-study. Still the nature-study idea is fundamentally right, accords with our experience, our knowledge of child psychology, and our scientific study of children's interests and correct methods of nature pedagogy.

Students of adolescence seem agreed,¹ in spite of their many disagreements, that there is a recrudescence of juvenile activity in growth of sensory and motor brain areas and of the sensory motor association areas in early adolescence. There would be expected then a renewed interest in things, in definite situations, and in concrete problems and projects. In so far there is good ground for a renewal of nature-study methods in the early years of the high school. If in the late grades the boys and girls begin to catch the viewpoint of organized science at all, we should expect a reversion to the more primitive nature-study interests in early high school. All students of adolescence further agree that there comes conspicuously to the front at this period marked social interests and somewhat later, economic ones. If one were at all justified in drawing conclusions from the meager facts at our command, the conclusions would be that the first-year science work in the high school should be organized somewhat on nature-study lines, at least in so far as the presentation of matter in concrete situations and projects is concerned, but that this should look toward an organization more on the basis of social and economic principles than was justified in the grade work.

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¹ "Adolescence," Monroe's *Cyclopædia of Education*; Meumann, *Expérimental pédagogique*.